

We claim:

1. A method of modifying a polypyrrolic macrocycle, said method comprising
5 reacting said macrocycle with a carbonyl ylide capable of forming a cyano containing macrocycle under refluxing conditions to produce a cyano containing compound, and
reducing a cyano group of said compound with a reducing agent to produce an amine group.
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2. The method of claim 1 wherein said carbonyl ylide is tetracyanoethylene oxide (TCNEO).
3. The method of claim 1 wherein said macrocycle is a photosensitizer.
15
4. The method of claim 3 wherein said photosensitizer is a porphyrin.
5. The method of claim 4 wherein said porphyrin is a tetraphenylporphyrin (TPP) or a diphenylporphyrin (DPP).
20
6. The method of claim 1 wherein said reducing agent is lithium aluminum hydride.
7. A method of modifying a polypyrrolic macrocycle, said method
25 comprising
reacting said macrocycle with a carbonyl ylide capable of forming a cyano containing macrocycle under refluxing conditions to produce a cyano containing compound, and

hydrolyzing a cyano group of said compound to produce an acid or carboxylate moiety.

8. The method of claim 7 further comprising derivatization of said acid or carboxylate moiety to be an ester, amide, or thioamide.

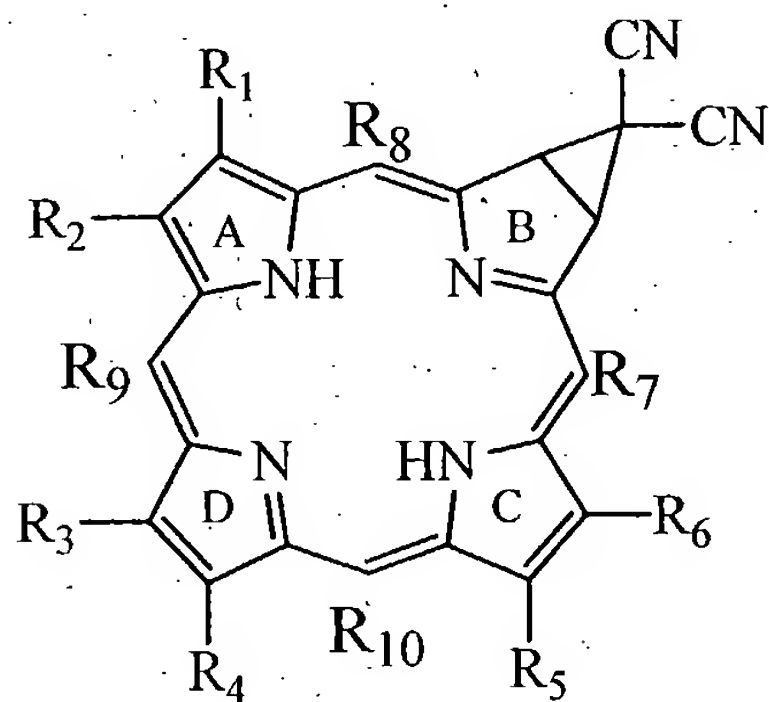
9. The method of claim 7 wherein said carbonyl ylide is tetracyanoethylene oxide (TCNEO).

10. The method of claim 7 wherein said macrocycle is a photosensitizer.

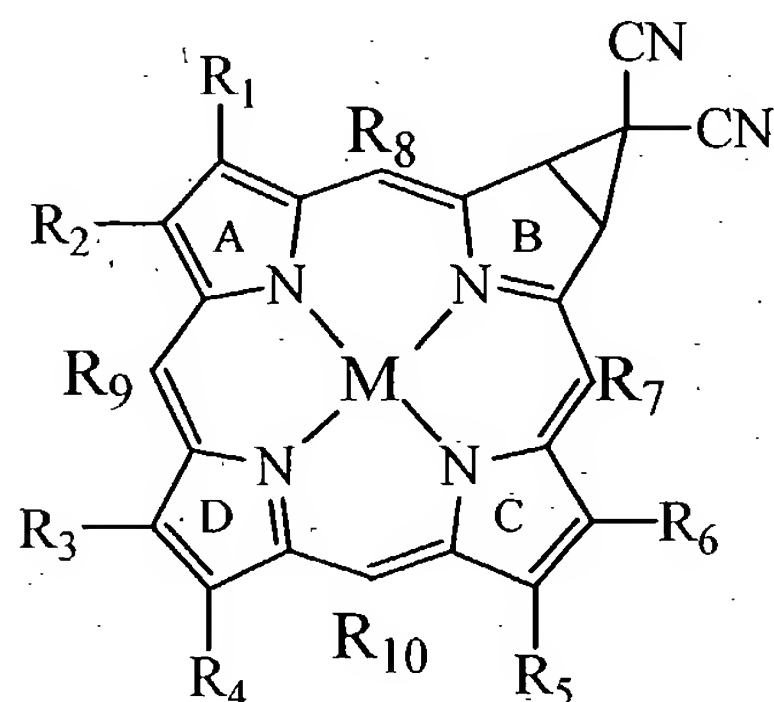
11. The method of claim 10 wherein said photosensitizer is a porphyrin.

12. The method of claim 11 wherein said porphyrin is a tetraphenylporphyrin (TPP) or a diphenylporphyrin (DPP).

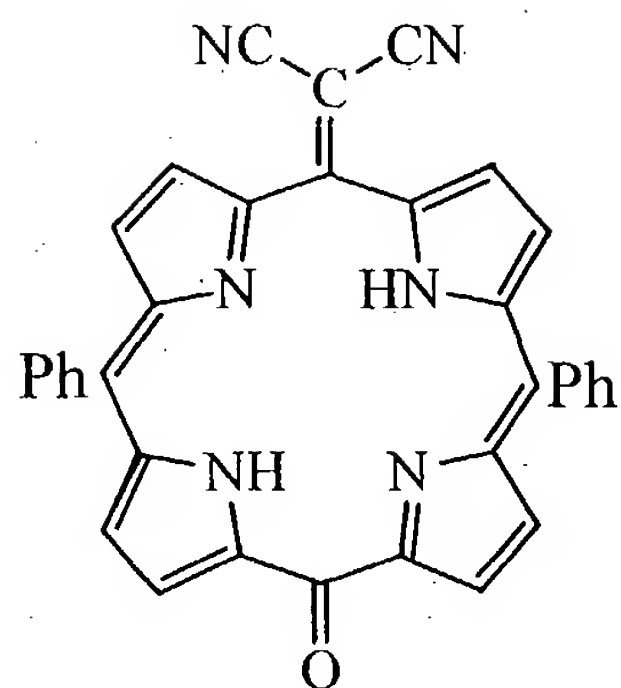
13. The method of claim 1 wherein said cyano containing compound has a structure represented by one of formulas III, IV, (1), (2), (3) or (4) below



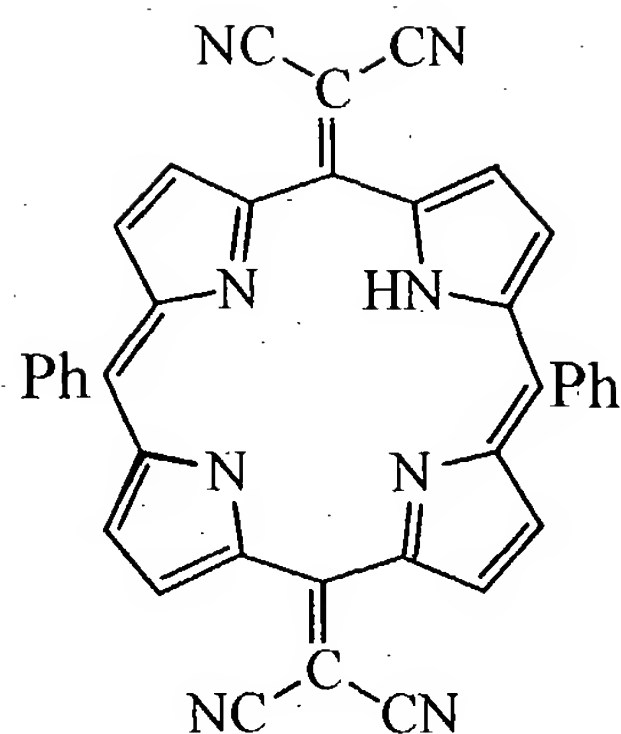
III



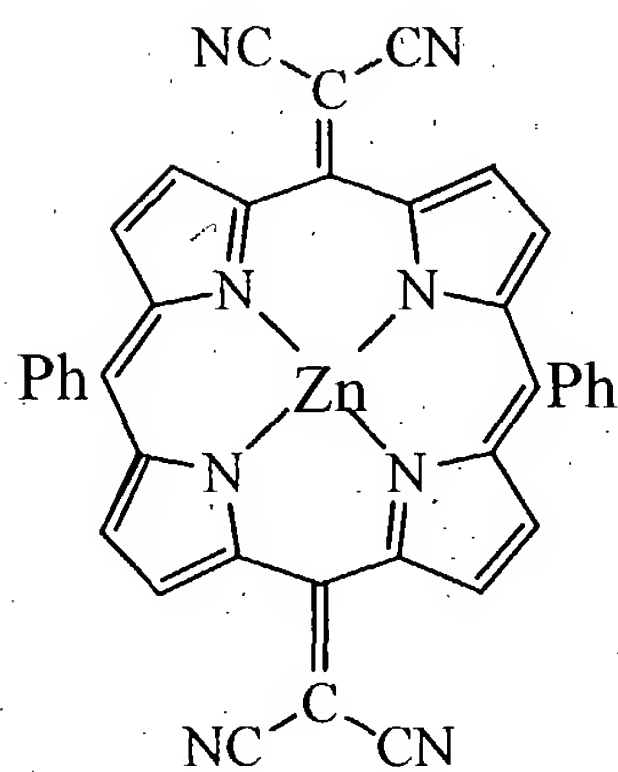
IV



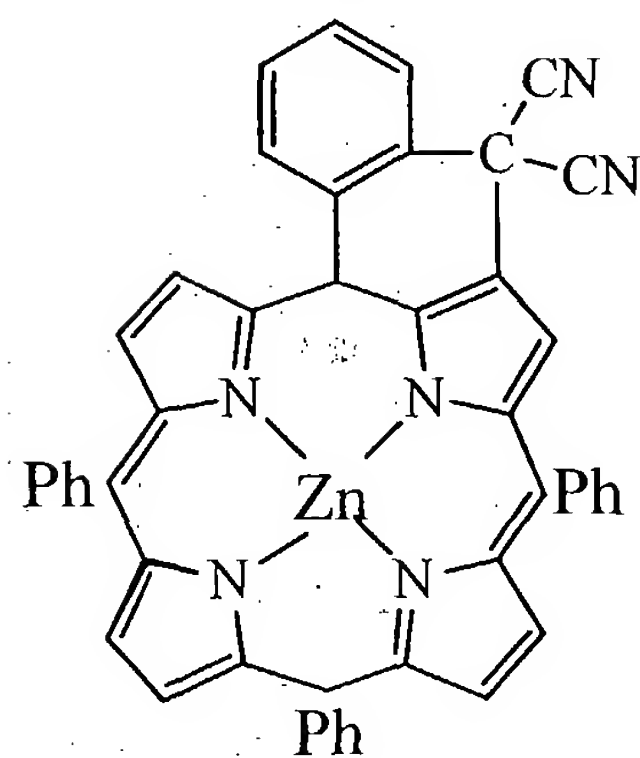
(1)



(2)



(3)



(4)

or

wherein

M is a metal selected from the group consisting of Ni(II), Cu(II), Zn, Sn, Ge, Si, Ga, Al, Mn(III), Gd(III), In and Tc;

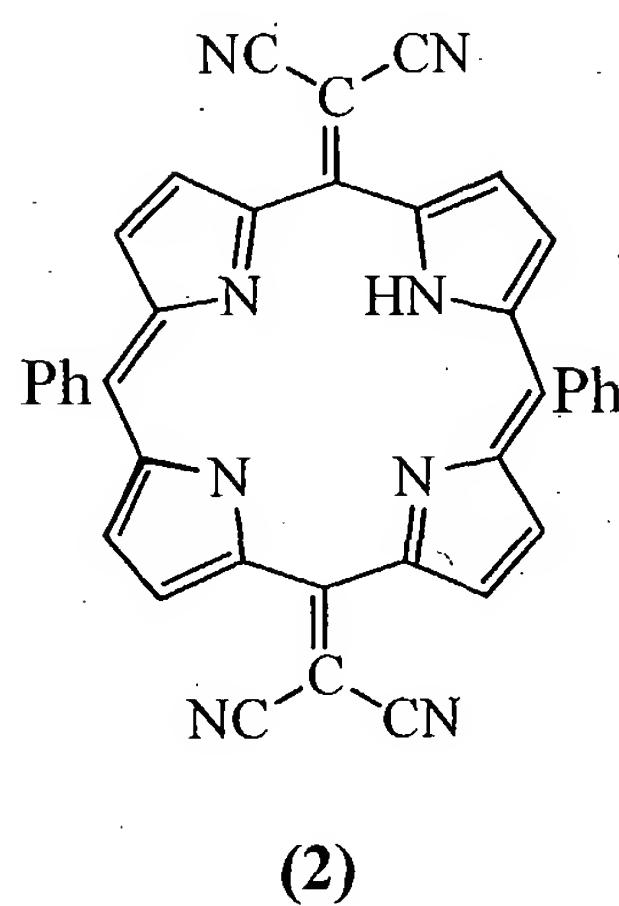
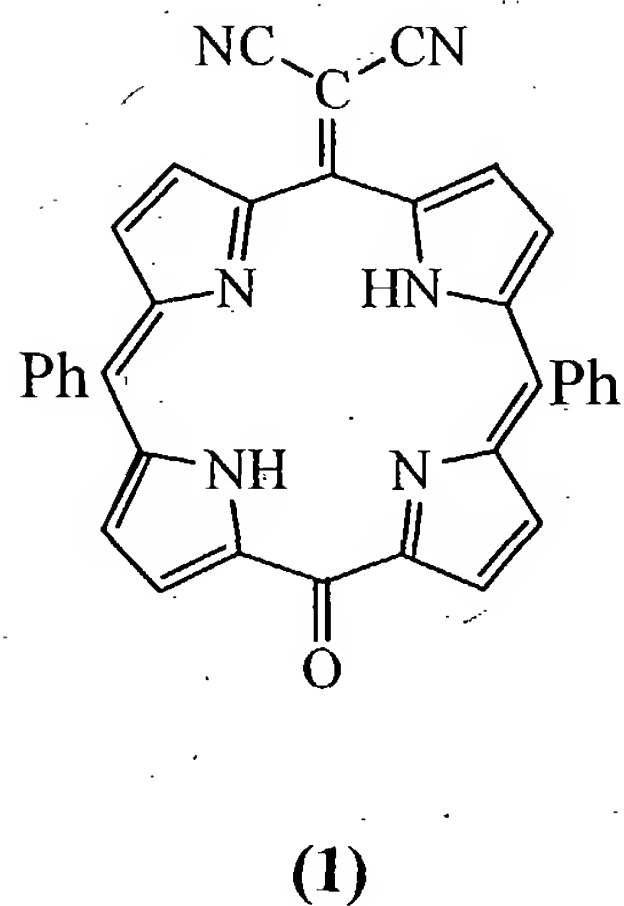
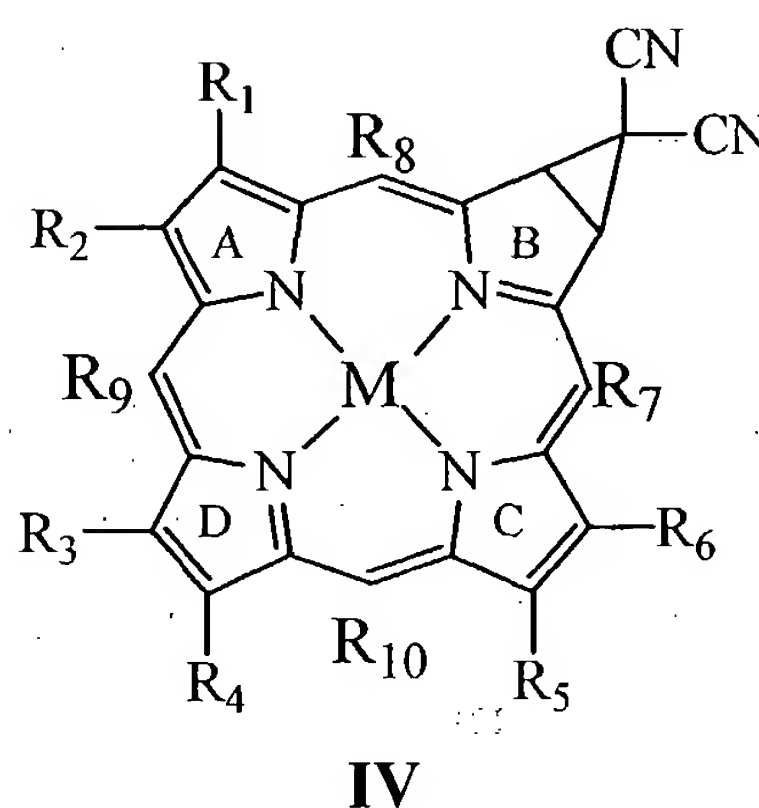
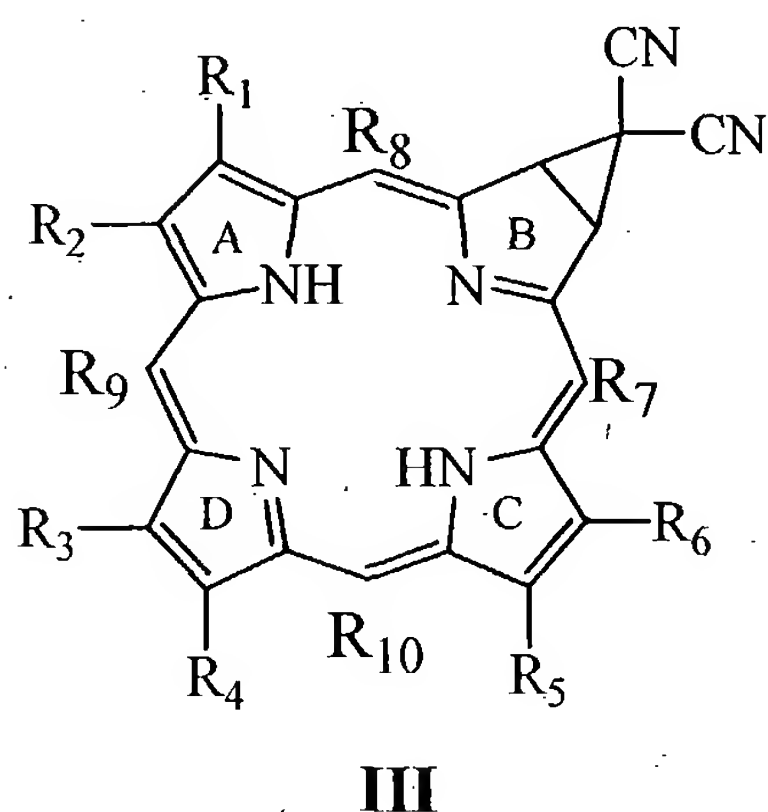
R₁ through R₆ are independently a hydrogen atom, a lower alkyl group, a lower alkyl carboxylic acid or acid ester group, keto, hydroxy, nitro, amino, or a group that, taken together with another pyrrolic ring, ring substituent or meso-substituent, forms a fused 5- or 6-membered ring; and

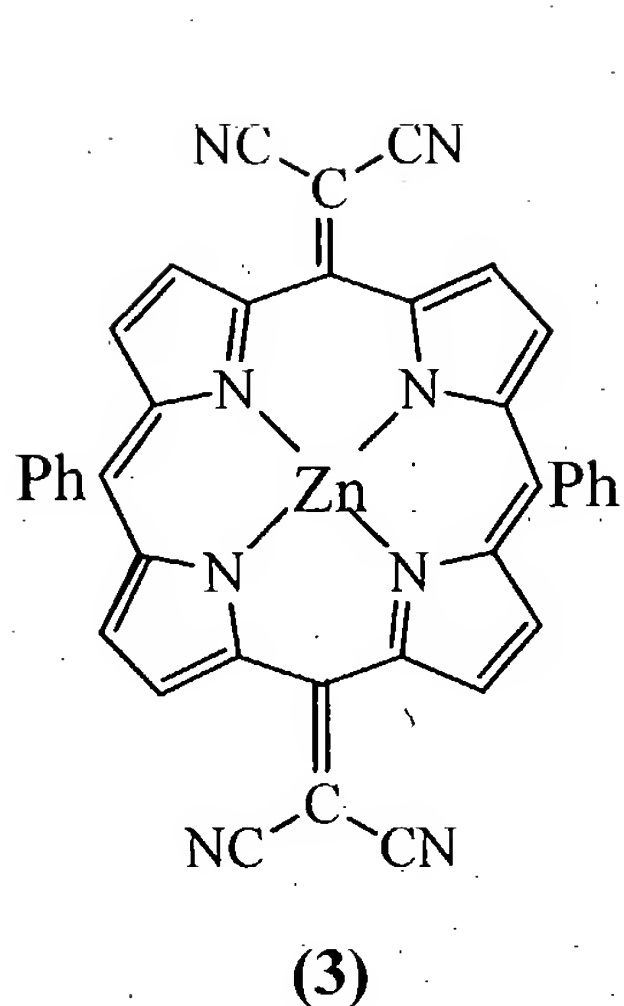
each of R₇ through R₁₀ is independently selected from H, substituted or unsubstituted alkyl groups, or substituted or unsubstituted aromatic rings,

or substituted or unsubstituted cycloalkyl groups, which may be the same or different; and

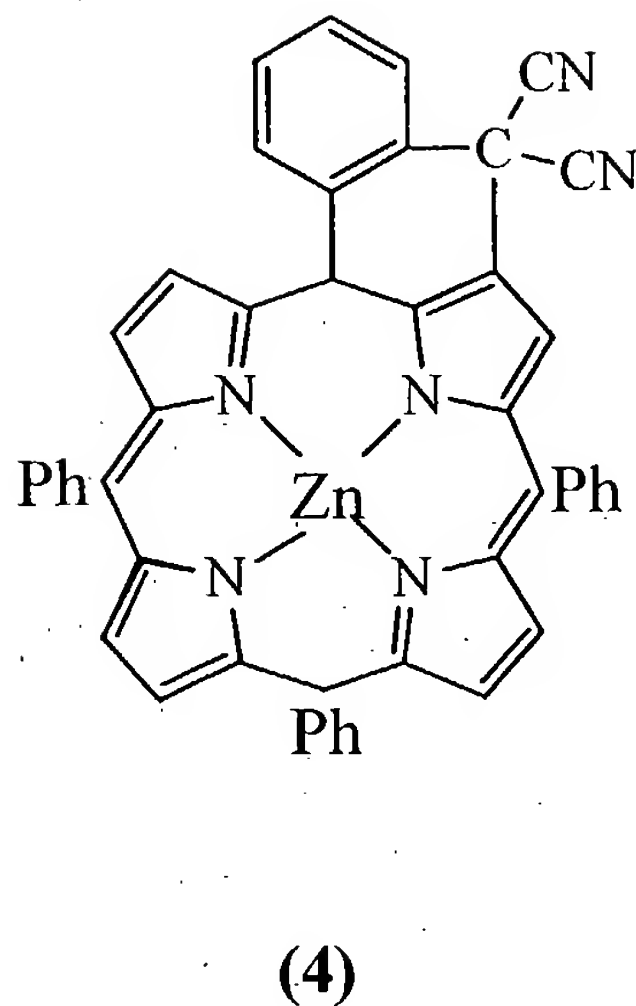
Ph is phenyl.

14. The method of claim 7 wherein said cyano containing compound has a structure represented by one of formulas III, IV, (1), (2), (3) or (4) below





or



wherein

15 M is a metal selected from the group consisting of Ni(II), Cu(II), Zn, Sn, Ge, Si, Ga, Al, Mn(III), Gd(III), In and Tc;

20 R_1 through R_6 are independently a hydrogen atom, a lower alkyl group, a lower alkyl carboxylic acid or acid ester group, keto, hydroxy, nitro, amino, or a group that, taken together with another pyrrolic ring, ring substituent or meso-substituent, forms a fused 5- or 6-membered ring; and

each of R_7 through R_{10} is independently selected from H, substituted or unsubstituted alkyl groups, or substituted or unsubstituted aromatic rings, or substituted or unsubstituted cycloalkyl groups, which may be the same or different; and

Ph is phenyl.

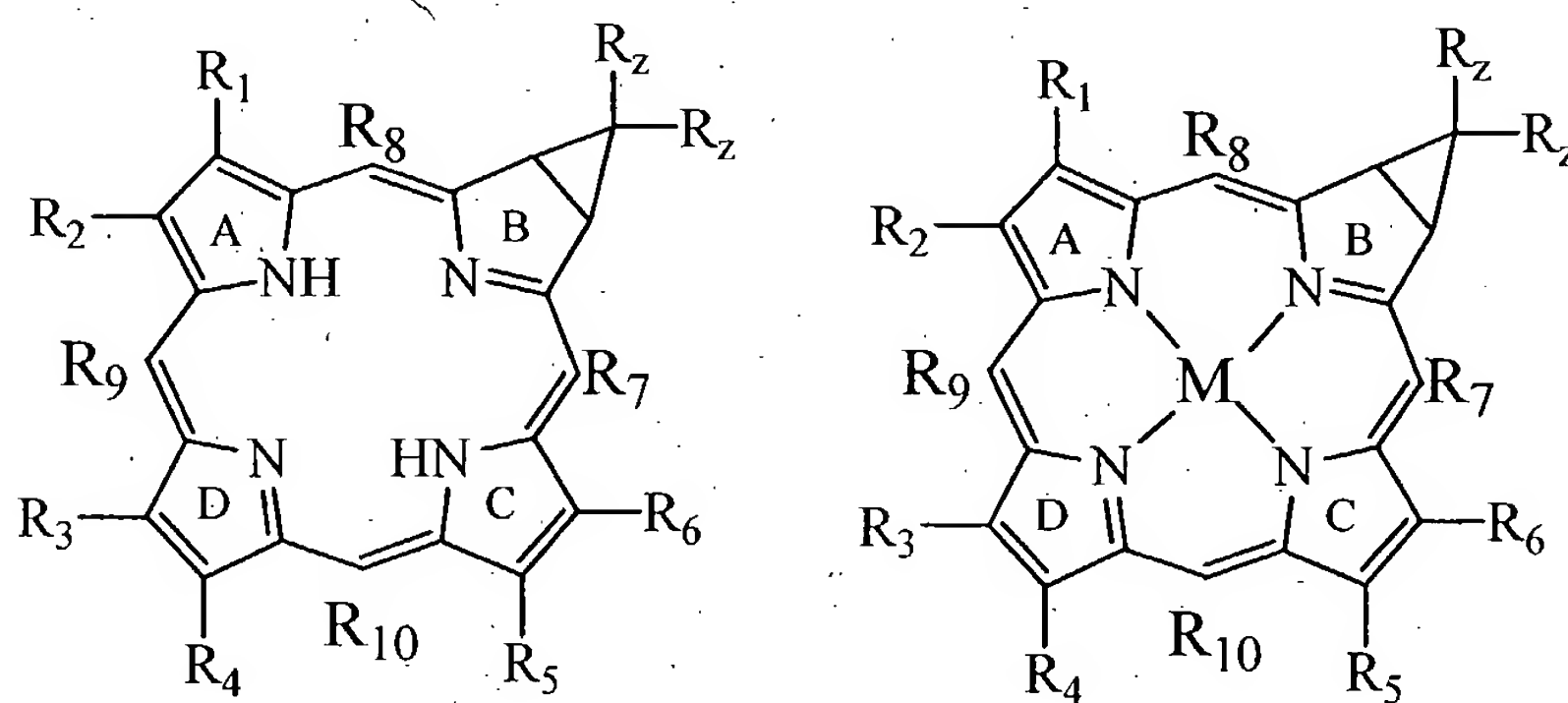
15. A compound produced by the method of claim 1.

25 16. A compound produced by the method of claim 6.

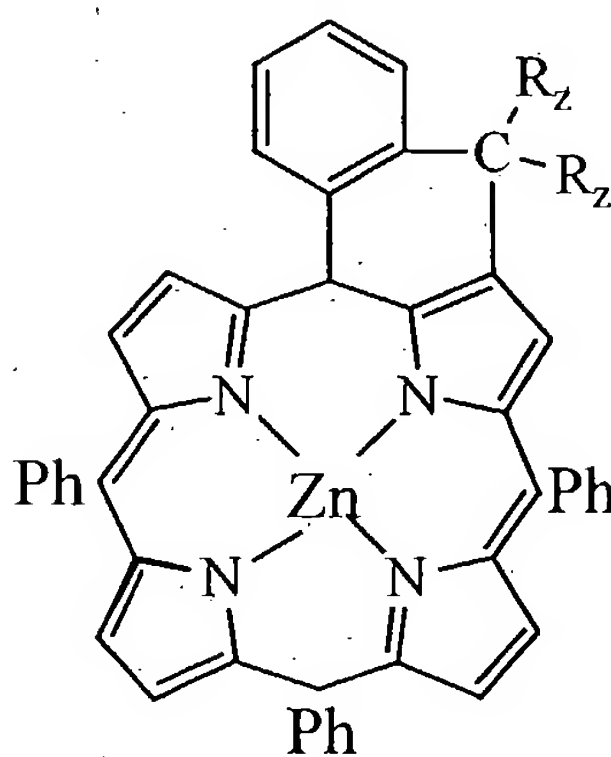
17. A compound produced by the method of claim 7.

18. A compound produced by the method of claim 8.

19. The compound of claim 16 having a structure represented by one of the following formulas



or



wherein

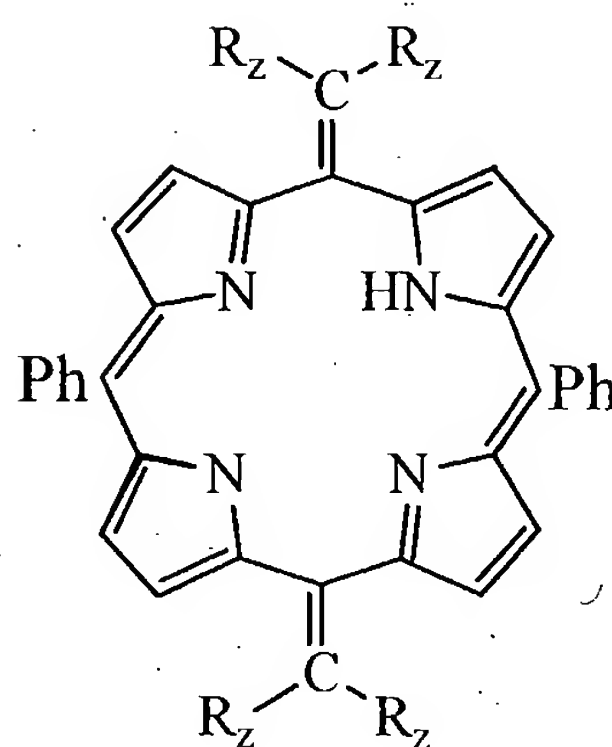
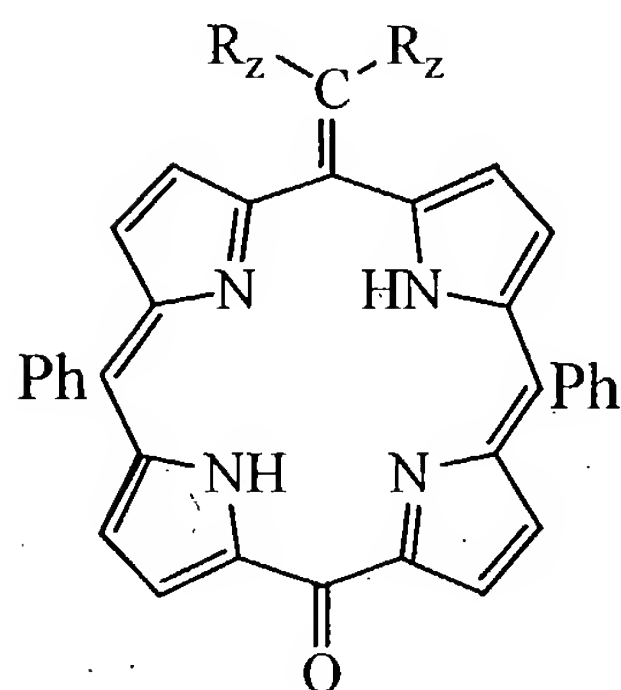
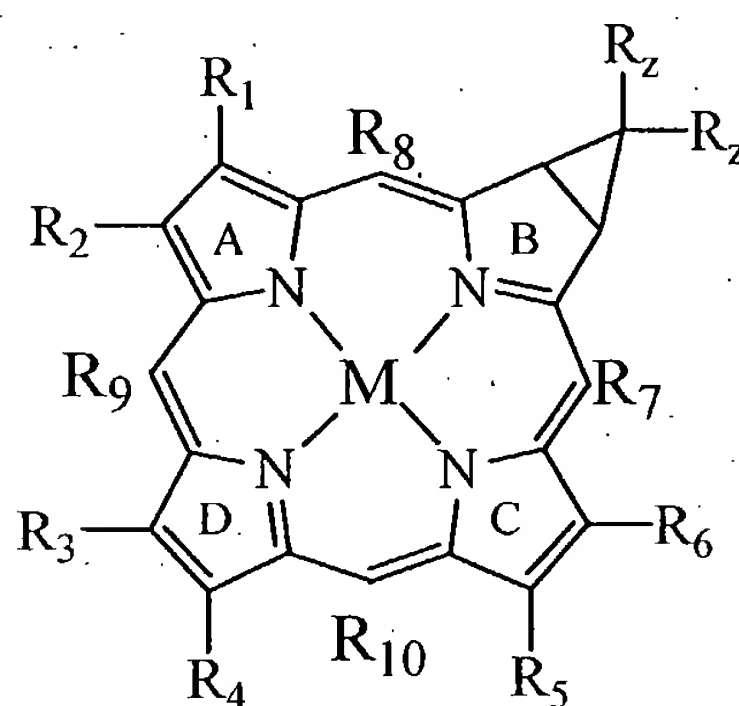
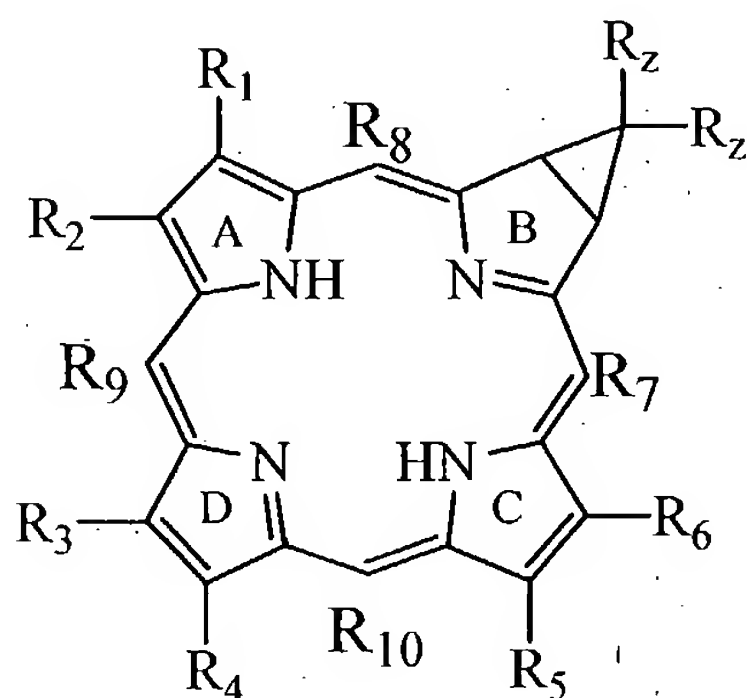
M is a metal selected from the group consisting of Ni(II), Cu(II), Zn, Sn, Ge, Si, Ga, Al, Mn(III), Gd(III), In and Tc;

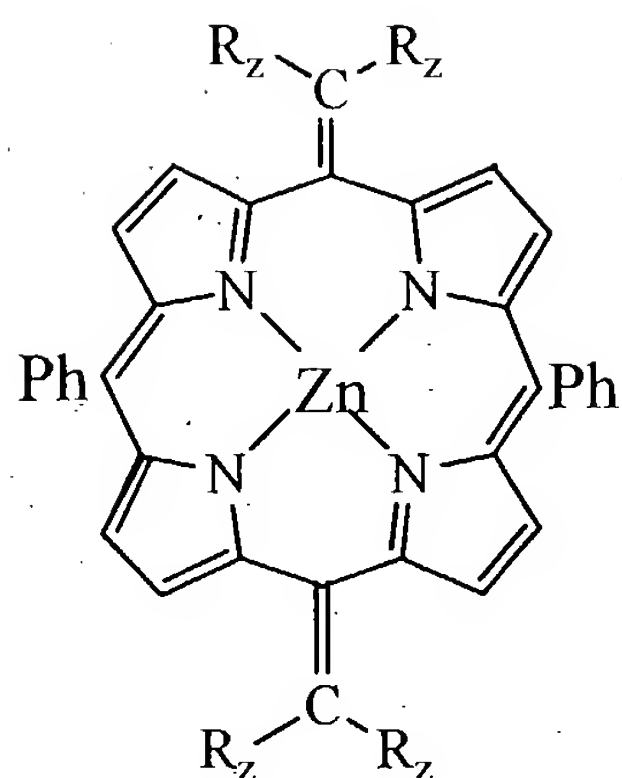
R_1 through R_6 are independently a hydrogen atom, a lower alkyl group, a lower alkyl carboxylic acid or acid ester group, keto, hydroxy, nitro, amino, or a group that, taken together with another pyrrolic ring, ring substituent or meso-substituent, forms a fused 5- or 6-membered ring; and

each of R_7 through R_{10} is independently selected from H, substituted or unsubstituted alkyl groups, or substituted or unsubstituted aromatic rings, or substituted or unsubstituted cycloalkyl groups, which may be the same or different; and

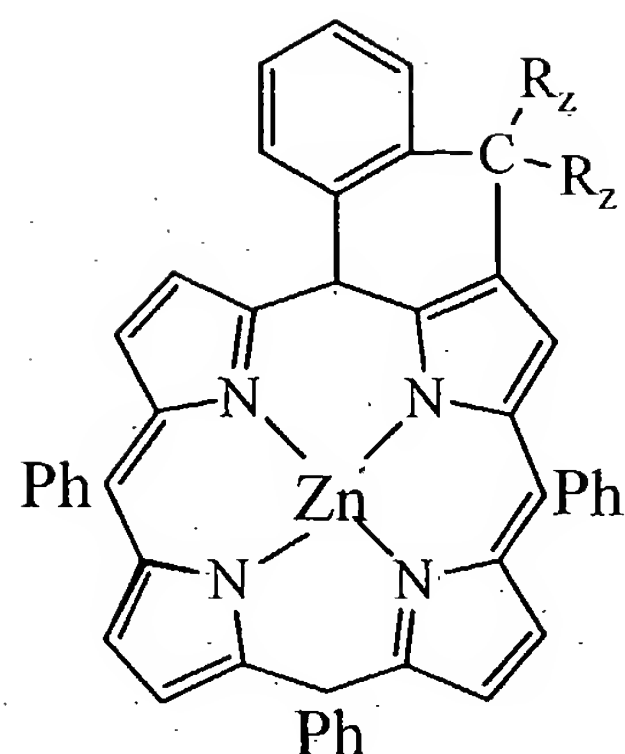
Ph is phenyl and $-R_z$ is $-\text{CN}$ where one or more $-R_z$ is $-\text{CH}_2\text{NH}_2$ resulting from reduction of said $-\text{CN}$.

20. The compound of claim 17 having a structure represented by one of the following formulas





or



wherein

10 M is a metal selected from the group consisting of Ni(II), Cu(II), Zn, Sn, Ge, Si, Ga, Al, Mn(III), Gd(III), In and Tc;

15 R₁ through R₆ are independently a hydrogen atom, a lower alkyl group, a lower alkyl carboxylic acid or acid ester group, keto, hydroxy, nitro, amino, or a group that, taken together with another pyrrolic ring, ring substituent or meso-substituent, forms a fused 5- or 6-membered ring; and

each of R₇ through R₁₀ is independently selected from H, substituted or unsubstituted alkyl groups, or substituted or unsubstituted aromatic rings, or substituted or unsubstituted cycloalkyl groups, which may be the same or different; and

20 Ph is phenyl and -R_z is -CN where one or more -R_z is -COOH resulting from hydrolysis of said -CN.